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Outcome Expectations and Osteoarthritis: Perceived Benefits of Exercise Are Associated with Self-Efficacy and Depression

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Abstract

Objective—Outcome expectancy is recognized as a determinant of exercise engagement and adherence. However, little is known about which factors influence outcome expectations for exercise among people with knee osteoarthritis. This is the first study to examine the association of outcome expectations for exercise with demographic, physical and psychosocial outcomes in individuals with knee osteoarthritis.

Methods—We performed a cross-sectional analysis of the baseline data from a randomized trial of Tai Chi versus physical therapy in participants with symptomatic knee osteoarthritis. Knee pain was evaluated using the Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index. Outcome expectations for exercise, self-efficacy, depression, anxiety, stress, and social support were measured using standard instruments. Logistic regression models were utilized to determine associates of outcome expectations.

Results—There were 262 participants with a mean age of 59.8 years, BMI 32.1 kg/m², 69.1% female, 51.5% white, mean disease duration 8.6 years, and mean WOMAC knee pain and function scores of 260.8 and 906.8, respectively. Higher outcome expectations for exercise were associated with greater self-efficacy (odds ratio [OR] 1.25, 95% confidence interval [95% CI] 1.11–1.41; P=0.0004) as well as with less depressive symptoms (OR 0.84 for each 5-point increase, 95% CI 0.73–0.97; P=0.01). Outcome expectancy was not significantly associated with gender, race, education, pain, function, radiographic severity, social support, anxiety, or stress.

Conclusions—Our results suggest significant associations between outcome expectations for exercise and self-efficacy and depression. Future studies should examine how these relationships

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longitudinally affect long-term clinical outcomes of exercise-based treatment for knee osteoarthritis.

Keywords

osteoarthritis; outcome expectations; self-efficacy; exercise

Introduction

Knee osteoarthritis (OA) is a progressive joint disease and a leading contributor to pain and functional disability. A large volume of literature has shown that exercise reduces pain and improves physical function in people with knee OA, with benefits extending even to those with severe disease (1). Accordingly, a vast majority of guideline recommendations, including those from the American College of Rheumatology, support exercise as a key intervention in the physical management of OA (2-4). Despite the evidence-based benefits and collective efforts to promote physical activity among people with knee OA, exercise implementation remains a considerable challenge in this population. High quality evidence from a recent meta-analysis demonstrated that only 13% of individuals with knee OA met physical activity guidelines (5). Thus, there is a pressing demand to identify the factors that influence exercise behavior among the knee OA population.

Exercise engagement and adherence in people with knee OA may be determined, in part, by the formulation of perceived benefits also known as outcome expectations. Viewed from the social-cognitive framework, individuals decide which course of action to undertake based on personal beliefs and expect pursued activities to produce desired outcomes (6). The degree of perceived physical and psychological benefits of exercise could positively or negatively influence behavior such that an individual with higher outcome expectations would be more motivated to exercise compared to someone with less perceived benefits (7, 8). The influence of outcome expectancy on physical activity is supported by a growing body of empirical evidence across different populations (9, 10) and holds true in the context of chronic pain conditions (11, 12) including osteoarthritis. A recent study of individuals with hip OA enrolled in an exercise program found that outcome expectations played a major role among participants choosing to continue physical activity (13). Similarly, in a study evaluating the efficacy of exercise on reduction of knee pain from osteoarthritis, participants who reported higher outcome expectations had greater motivation to maintain exercise (14). Despite the substantial evidence supporting the predictive role of outcome expectancy, there is a poor understanding of the personal characteristics affecting this construct among people with knee OA.

The relationships surrounding outcome expectations for exercise in individuals with knee OA remain largely elusive; however, several qualitative studies have proffered associated themes. Among adults with knee pain, perceived benefits of exercise appeared to be shaped by significant others or healthcare professionals, past experiences, and uncertainty regarding the role of exercise (15). Additionally, varying objective opinions regarding exercise benefits appointed to different levels of radiographic severity suggested that expectations may depend on perceptions of disease activity. Disease-specific factors such as pain and

functional limitations have also been shown to influence perceived negative outcomes for exercise in adults with arthritis (16). Although these emergent themes shed light on possible factors, no study has directly tested the associates of outcome expectations for exercise in people with knee OA.

Recently, exploring variables in relation to outcome expectations has been targeted in an effort to understand exercise behavior and strengthen theoretical frameworks for improving physical activity. Research has identified factors including mental health, self-efficacy, fear of falling, and disease knowledge (9, 10). Relationships to demographic variables such as race and gender have not been consistently demonstrated (7, 17-23), although some evidence suggests that higher education levels may be related to greater outcome expectations for exercise (24). Far less is known about these influential factors in individuals with knee OA. Identifying well-defined associates of outcome expectancy will provide insights for designing interventions to optimize exercise participation. Furthermore, the potential malleability of identified psychosocial relationships may have therapeutic implications. Therefore, we aimed to evaluate the associations between baseline outcome expectations for exercise and demographic, physical, and psychosocial factors in people with knee OA. We hypothesized that better psychosocial health (higher self-efficacy and social support; lower levels of depression, stress, and anxiety), lower disease severity (less pain and radiographic severity; higher physical function), and higher education levels would be positively associated with higher outcome expectations for exercise. We posed no *a priori* hypotheses on the association between outcome expectations and race or gender.

Methods

Study design

This study is a cross-sectional, secondary analysis of data obtained at baseline assessment from a single-center, randomized comparative effectiveness trial of Tai Chi versus a physical therapy regimen for participants with symptomatic knee OA. The study was approved by the Institutional Review Board of the Tufts Medical Center and was completed in September 2014. Signed informed consent was obtained from all study participants. A detailed study protocol has been published (25).

Recruitment procedures

We employed various advertising strategies to ensure enrollment of a diverse study population and queried the rheumatology clinic patient database. Interested respondents received standardized information pertaining to the study and underwent preliminary screening by telephone which encompassed questions about eligibility whose predictive values for knee OA were established from population-based data (26). Potentially eligible subjects who reported a diagnosis of knee OA and who had no obvious contraindications were invited to attend a formal screening visit at the clinic.

Eligibility criteria

Inclusion criteria at the preliminary screening include: (1) age 40 years and older with a prior diagnosis of knee OA and (2) pain on more than half the days of the past month during

at least one of the following activities: walking, going up or down stairs, standing upright, or lying in bed at night. Exclusion criteria include: (1) prior experience with Tai Chi, physical therapy (PT) or similar types of exercise in the past 1 year; (2) serious medical conditions limiting the ability and safety to participate in the trial; (3) any intraarticular steroid injections in the previous 3 months or reconstructive surgery on the affected knee; (4) any intra-articular hyaluronic acid injections in the previous 6 months; (5) enrollment in any other clinical trial within the last 30 days; (6) plan to permanently relocate from the region during the trial period; and (7) not English-speaking.

Screening procedures

A study rheumatologist reviewed and confirmed the eligibility of participants. All participants met American College of Rheumatology criteria confirming symptomatic and radiographic knee OA (defined as the presence of a definite osteophyte in the tibiofemoral compartment and/or the patellofemoral compartment, as assessed on standing anterior/posterior and lateral or sunrise views). All participants who attended the screening visit and completed the Outcome Expectations for Exercise Scale and at least one other measure of interest were included in this analysis. Participants did not know to which group they would be randomized at the time of this visit.

Measures

Outcome expectations

Outcome expectancy is the anticipation that a particular behavior will produce a desired outcome (6). The Outcome Expectations for Exercise Scale (OES) is a validated scale consisting of 9 questions to evaluate perceived physical and mental benefits of exercise (27). Each item is rated from 1 to 5 (1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree). The total score was derived by taking the average of all responses (range of 1 to 5). Higher scores represent higher outcome expectations.

Self-efficacy

Self-efficacy is the conviction that one can execute a behavior required to produce a desired outcome (6). Participants' confidence in their ability to manage symptoms of arthritis was assessed using the 8-item Arthritis Self-Efficacy Scale (ASES-8) (9). Each belief was rated on a 10-point Likert scale where 1 = very uncertain and 10 = very certain. The total score was the average of all responses. Higher scores indicate better self-efficacy.

Depression

The presence or severity of depressed mood was measured using the Beck Depression Inventory-II (BDI-II), a validated, self-report instrument that contains 21 items. The score was derived from summing the numerical ratings (range 0 to 63) with higher scores indicating greater severity of depression. BDI-II scores ranging from 0-13 represent minimal depression; scores from 14-19 are mild; scores from 20-28 are moderate; and scores from 29-63 represent severe depression (28).

Anxiety

Anxiety was measured using the Patient-Reported Outcomes Measurement Information System (PROMIS; www.nihpromis.org) Emotional Distress-Anxiety Short Form (version 1.0), a 7-item questionnaire based on a 5-point scale (1 = never; 2 = rarely; 3 = sometimes; 4 = often; and 5 = always). The total score was converted to a standardized T-score (range of 36 to 82) with higher scores indicating greater severity of anxiety.

Stress

Stress was measured with the Perceived Stress Scale (PSS), a 10-item self-report questionnaire. For each item, participants indicated how often they experienced the symptom, from never (0) to very often (4). The total score was the sum of the numerical rating for each response and ranged from 0 to 40 with higher scores indicating greater perceived stress (29).

Social support

Social support was evaluated with the Medical Outcomes Study Social Support Survey (MOS-SSS), a 19-item questionnaire devised to measure the perceived availability of functional support (30). For each item, the respondents were asked to indicate how often each type of support was available to them when needed on a 5-point scale (1 = none of the time; 2 = a little of the time; 3 = some of the time; 4 = most of the time; and 5 = all of the time). The total score was converted to a scale of 0 to 100, with higher scores reflecting greater social support.

Pain and functional limitations in knee osteoarthritis

Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) (version VA3.1) is a validated, self-administered visual analogue scale designed to evaluate knee and hip osteoarthritis (31). It consists of three separate subscales: pain (score range 0–500), stiffness (0–200), and physical function (0–1700), with higher scores indicating more severe disease. Knee pain was measured using the WOMAC pain subscale, which includes 5 items regarding pain at activity or rest experienced in the past 48 hours. Functional limitations were measured by using the WOMAC physical function subscale that includes 17 items pertaining to difficulty with knee and/or hip function experienced in the previous 48 hours. Scores of WOMAC subscales were reported as the sum of all items.

Radiographic severity of knee osteoarthritis

Knee radiographs in standing anteroposterior, lateral, and sunrise views were obtained at the initial screening examination. Tibiofemoral radiographic severity was determined for each knee compartment based on osteophyte formation, joint space width, and subchondral bone sclerosis in accordance with the Kellgren-Lawrence scoring system (32).

Statistical Analysis

Descriptive statistics, including means and frequencies, were generated for participant characteristics and measures of interest. Incomplete surveys were excluded from analysis for

the measures of interest. Outcome expectations for exercise were the primary outcome of interest. The Outcome Expectations for Exercise Scale (OES) variable was not normally distributed and skewed toward the higher range with a median of 4; therefore, assumptions of linear regression could not be met. We created a binary variable for OES (<4 vs. ≥4). Independent *t*-tests were used to test for differences in continuous measures between low (OES <4) and high outcome expectancy (OES ≥4) categories. Univariate logistic regression models were generated to assess the relationship between participant characteristics and high outcome expectations. All analyses were performed in SAS 9.4 (SAS Institute Inc., Cary, NC). A P-value of less than 0.05 was considered statistically significant.

Results

Baseline demographic and clinical characteristics

Table 1 provides baseline demographic, clinical, and psychosocial characteristics of the participants. The analysis included data obtained at baseline assessment from 262 participants with a mean age of 59.8 years, 69.1% female, 51.5% white, 45.4% with at least college-level education, and an average body mass index of 32.1 kg/m². The mean duration of disease was 8.6 years, and the mean WOMAC pain and function scores were 260.8 and 906.8, respectively. Of 247 patients who had knee radiographs evaluated, 41 (16.6%) were rated Kellgren-Lawrence grade 4, 81 (32.8%) grade 3, and 125 (50.6%) grade 2 or lower. The mean Outcome Expectations for Exercise Scale (OES) score was 4.0.

Table 2 provides the descriptive statistics for each item in the OES questionnaire. The overall mean was 4.0 with a standard deviation of 0.8. Item means ranged from 3.6 to 4.2. Item 3 (“Makes me feel less tired”) had the lowest mean score of 3.6, whereas item 1 (“Makes me feel better physically”) and item 4 (“Makes my muscles stronger”) had the highest mean score of 4.2. Item response distributions showed modest variability with standard deviations ranging from 0.9 to 1.0.

Associations between constructs and high outcome expectancy for exercise

Table 3 illustrates the associations between variables and high outcome expectancy for exercise. Patients with higher self-efficacy were more likely to have higher outcome expectations for exercise (ASES-8 odds ratio [OR] 1.25, 95% confidence interval [95% CI] 1.11–1.41; P=0.0004). Individuals with a higher depressed mood as assessed by Beck Depression Inventory-II (BDI-II) were less likely to have higher outcome expectations (BDI-II OR 0.84 for each 5-point increase, 95% CI 0.73–0.97; P=0.01). Higher perceived stress (P=0.06) and female gender (P=0.08) were borderline significant and less likely to have higher outcome expectations. No other significant associations were found.

Difference in means of measures between low and high outcome expectancy categories

Table 4 illustrates the difference in means of continuous measures between low and high outcome expectations. A significant difference in mean ASES-8 score between the lower outcome expectancy group (5.6 ± 2.1) and higher outcome expectancy group (6.6 ± 2.1) was observed (P=0.0002). Patients with lower outcome expectations had a mean BDI-II score of

9.6 ± 10.7, as compared to 6.7 ± 7.7 in patients with higher outcome expectations (P=0.01). Perceived Stress Scale (PSS) was borderline significant (P=0.06).

Discussion

This is the first study to assess the previously unexamined relationships between baseline outcome expectations for exercise and psychosocial, disease-specific, and demographic factors in participants with knee OA. As we hypothesized, the findings indicated that higher outcome expectations were significantly associated with higher self-efficacy and less depressed mood. Male gender and lower perceived stress trended towards an association with higher outcome expectations but did not reach statistical significance. Education, race, anxiety, social support and disease-specific variables were not found to be significantly associated with outcome expectations.

We found that participants who reported higher outcome expectancy were significantly more likely to have stronger convictions in their ability to execute symptom management for knee OA. Defined as the belief in one's ability to execute a behavior required to produce a desired outcome, self-efficacy has been posited as a psychosocial construct operating in conjunction with outcome expectancy to influence behavior (33). In support of this theory, two cross-sectional studies demonstrated that higher outcome expectations for exercise were significantly related to greater self-efficacy (9, 10). Our study is the first to confirm this association in people with knee OA. Provided that outcome expectancy may influence physical activity in this population, assessing individual beliefs in both exercise benefits and symptom management would allow clinicians and researchers to characterize the degree of willingness to exercise. Furthermore, the incorporation of outcome expectancy and self-efficacy into risk stratification measures for non-adherence would benefit future trials of exercise-based interventions for people with knee OA.

Beyond the evaluation of outcome expectancy and self-efficacy, a number of studies have attempted to modify these constructs by employing social cognitive interventions (34). Physician-based activity counseling (35) and lifestyle interventions (36) demonstrated positive effects in strengthening both outcome expectancy and self-efficacy. Interestingly, healthcare professionals have been shown to influence outcome expectations for exercise in people with knee pain (15). Taken together, these findings suggest that physician counseling may have a significant impact on raising perceived benefits of exercise in the knee OA population, although this has not yet been studied. Future studies are warranted to verify the effects of physician counseling on modifying this psychosocial construct as well as to determine if such improvement could increase exercise engagement.

We also found that less depressed mood was significantly associated with higher outcome expectations. This finding adds to previous research suggesting that depressed individuals are more inclined to hold a pessimistic attitude about exercise outcomes (37, 38). Two studies confirmed an association of greater depressive symptoms with lower exercise expectations (39, 40). Depressed individuals tend to favor negative information and recall fewer positive experiences (41). This negative thinking may reduce outcome expectations for exercise (42). Moreover, research (43) indicates that depression poses a risk for motivational

deficits characterized by the imbalance of negative (44) and positive outcome expectations (45). Provided that depressed individuals with knee OA are more likely to hold pessimistic beliefs towards exercise and be less willing to participate, future trials should assess the level of impact that reducing depressive symptoms may have on outcome expectancy in this population.

Participants with lower perceived stress tended to have higher outcome expectations, although this did not reach statistical significance. Stress was negatively associated with outcome expectancy in a study among people with knee OA (18). However, this study utilized an outcome expectation scale for a psychotherapeutic intervention. This suggests that outcome expectancy and its relationships with other psychosocial constructs could vary depending on intervention type. According to the social cognitive theory, past experience with a specific behavior influences the formulation of outcome expectancy (46). Thus, one may posit that perceptions of benefit are, to some degree, related to past experience with the form of intervention. As individuals with knee OA tend to be more familiar with exercise as opposed to other interventions such as cognitive behavioral therapy or surgery, there may be heterogeneity among outcome expectations and their respective associates. Future studies are warranted to elucidate upon the potential variations between outcome expectations for different interventions in people with knee OA.

We did not find an association between social support and outcome expectations for exercise. Previous studies similarly showed that social support was unrelated to outcome expectations for physical activity (7, 47). Contrastingly, a study of participants with knee OA undergoing cognitive behavioral therapy found that higher social support was significantly related to greater outcome expectations for treatment (18). The difference between these results may be attributable to varying perceptions regarding intervention type. Pretreatment anxiety was also not found to be associated with outcome expectations for exercise. This may be explained by the overall lower levels of reported anxiety as compared to the general population.

We did not find a significant association with outcome expectations for exercise and osteoarthritis-specific variables including pain, function, and radiographic severity at baseline. In agreement with our results, negative findings were reported in prior studies investigating expectation of benefit from different interventions for OA. Pain and physical function were not related to outcome expectancy in a trial of pain coping training in knee OA patients (18). Furthermore, in studies of patients scheduled for knee arthroplasty (48, 49), pre-surgical outcome expectancies were also not associated with WOMAC pain and function subscales. Interestingly, the emergent themes from a qualitative study suggest that arthritis-related symptoms such as pain and functional limitations may influence perceived negative outcomes for exercise (16). Additionally, in a survey conducted among people with knee pain, consensus regarding expectations of exercise benefit for radiographic knee OA decreased with disease severity (15). As these studies were conducted among community-dwelling adults, it is possible that disease-related factors may have less influence on outcome expectancy in people actively seeking exercise-based interventions.

No significant relationships were found between outcome expectations for exercise and gender, race, or education. Although male gender tended to have higher outcome expectations, statistical significance was not reached. Studies among other populations yielded conflicting results regarding gender. Collectively, male participants exhibited either stronger (21, 22) or weaker (7, 20) expectations for exercise, whereas remaining studies demonstrated no association (17-19, 23). The lack of influence of race has been generally consistent (18, 19) despite one study which reported that African Americans had higher levels of outcome expectations (7). Contrary to our hypothesis, we found no association between education level and outcome expectations for exercise. Among the limited literature, one study in adults with arthritis found that the average outcome expectations for exercise in their sample was below the normative value reported for similarly aged community-dwelling adults with a higher educational level (24). No relationship to education was found among adults with osteoporosis participating in an exercise program (10). Due to the collective lack of associations between race, gender, or education and outcome expectancy, it is unlikely that these demographic factors can predict or influence perceived benefits of exercise in the knee OA population.

Limitations

Study limitations should be considered. First, due to the cross-sectional nature of the study design, causal inferences cannot be drawn from the findings. Second, this investigation was performed among a population of people with knee OA seeking treatment and willing to participate in an exercise intervention. This may be reflected by the positively skewed OES score. Although small variations in outcome expectations were observed in this group, it is possible that a greater variation may occur among a more epidemiologic representation such as community-dwelling individuals with knee OA. This underscores the importance of identifying patients at risk of exercise non-adherence who may benefit from preemptive measures targeted at improving outcome expectations. Future research is required to compare outcome expectations among individuals with knee OA depending on their willingness to actively seek treatment.

Additionally, the subset of participants in this study was narrowed to those reporting to have greater frequency of pain following certain activities, which limited the ability to investigate expectations among a population with a wider spectrum of pain. Despite the association we identified between outcome expectations and mood, our population was not very depressed. It is unclear if the association would remain in a more depressed population. It is also important to note that this was a sample of patients specifically seeking treatment in the form of Tai Chi or physical therapy. Further research is urged to explore the perceptions of different forms of exercise such as mind-body therapy and how they may affect outcome expectancy among people with knee OA.

Despite these limitations, our analyses suggest that higher outcome expectations for exercise are associated with stronger self-efficacy and better mood. By discovering new and significant relationships, this study advances the current understanding of exercise beliefs among people with knee OA through psychosocial constructs and may aid and impact the design of future exercise trials. It is likely that individuals with weaker confidence in

symptom management and with depressed mood may be more pessimistic about exercise and potentially less inclined to participate. These relationships may be useful for identifying subgroups at risk for non-adherence in both the clinical and research setting. Overall, prospective longitudinal studies are warranted to assess the impact of outcome expectations for exercise, self-efficacy, and depression on adherence and treatment outcomes in individuals with knee OA. Furthermore, research focus should be directed towards examining the malleability of these factors and their subsequent effect on exercise implementation.

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Significance and Innovations

This is the first study to examine the relationships between outcome expectations for exercise and demographic, physical, and psychosocial outcomes in individuals with knee osteoarthritis.

Participants with greater outcome expectations for exercise reported higher self-efficacy and better mood.

Identifying the factors that influence outcome expectations for exercise in persons with knee osteoarthritis is a key step for improving future trial design and treatment optimization.

Future longitudinal studies of exercise-based interventions are warranted to explore how outcome expectations for exercise in conjunction with self-efficacy and depression affect clinical outcomes in people with knee osteoarthritis.

Table 1

Demographic, disease-related, and psychological characteristics of the participants

Characteristic	N	Mean (SD) or n (%)
Age, years	261	59.8 (10.5)
Gender, female	262	181 (69.1%)
Race	262	
White		135 (51.5%)
Black		91 (34.7%)
Other		36 (13.7%)
Education	262	
High school or less		50 (19.1%)
Trade school or some college		93 (35.5%)
College		53 (20.2%)
Graduate school		66 (25.2%)
Body mass index kg/m ²	259	32.1 (7.4)
Kellgren-Lawrence grade	247	
Grade 4		41 (16.6%)
Grade 3		81 (32.8%)
Grade 2		125 (50.6%)
Duration of knee pain, years	208	8.6 (10.9)
WOMAC pain subscale (0.0 – 500.0) ^a	262	260.8 (99.5)
WOMAC function subscale (0.0 – 1700.0) ^a	260	906.8 (350.1)
Outcome Expectations for Exercise Scale (1.0 – 5.0) ^a	262	4.0 (0.8)
Arthritis Self-Efficacy Scale-8 (1.0 – 10.0) ^a	262	6.2 (2.1)
Beck Depression Inventory-II (0.0 – 63.0) ^a	256	7.9 (9.1)
PROMIS Distress-Anxiety Short Form, t-score (36.0 – 82.0) ^a	262	50.1 (8.8)
Perceived Stress Scale (0.0 – 40.0) ^a	261	13.2 (7.0)
MOS Social Support Survey (0.0 – 100.0) ^a	257	66.6 (23.5)

MOS, Medical Outcomes Study; PROMIS, Patient-Reported Outcomes Measurement Information System; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index.

^aTotal scale range

Table 2

Descriptions and statistics of Outcome Expectations for Exercise Scale (OES) items^a

Item	Description	No.	Mean	SD	Median
1	Makes me feel better physically	262	4.2	1.0	4.0
2	Makes my mood better in general	261	4.1	1.0	4.0
3	Makes me feel less tired	262	3.6	1.0	4.0
4	Makes my muscles stronger	260	4.2	0.9	4.0
5	Is an activity I enjoy doing	262	3.7	1.0	4.0
6	Gives me a sense of personal accomplishment	261	4.0	0.9	4.0
7	Makes me more alert mentally	262	3.9	0.9	4.0
8	Improves my endurance in performing my daily activities	261	4.1	0.9	4.0
9	Helps to strengthen my bones	261	4.1	0.9	4.0

^aScores range from 1 to 5, with 1 indicating low outcome expectations for exercise and 5 indicating high outcome expectations.

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Table 3

Associations between variables and high outcome expectancy category (OES = 4.0)

Variable	OR (95% CI)	<i>p</i> value
Gender		0.08
Female	0.62 (0.36, 1.07)	
Male	–	
Race		0.91
White	–	
Black	1.08 (0.51, 2.29)	
Other	0.92 (0.54, 1.57)	
Education		0.13
Graduate school	1.41 (0.74, 2.71)	
College graduate	1.47 (0.73, 2.96)	
Trade or some college	–	
High school or less	0.64 (0.32, 1.28)	
Radiographic severity of tibiofemoral osteoarthritis		0.12
Kellgren-Lawrence grade 4	–	
Kellgren-Lawrence grade 3	0.70 (0.31, 1.58)	
Kellgren-Lawrence grade 2	0.48 (0.22, 1.02)	
WOMAC pain subscale (100 unit increase)	0.97 (0.76, 1.25)	0.84
WOMAC function subscale (100 unit increase)	0.97 (0.90, 1.04)	0.41
Arthritis Self-Efficacy Scale-8 (1 unit increase)	1.25 (1.11, 1.41)	0.0004
Beck Depression Inventory-II (5 unit increase)	0.84 (0.73, 0.97)	0.01
PROMIS Distress-Anxiety Short Form (5 unit increase)	1.01 (0.88, 1.17)	0.86
Perceived Stress Scale (5 unit increase)	0.84 (0.70, 1.01)	0.06
MOS Social Support Scale (10 unit increase)	1.05 (0.94, 1.16)	0.41

Table 4Difference in means of measures between low and high outcome expectancy categories^a

Measure	Outcome expectancy category		p value
	OES < 4.0 (N = 108)	OES 4.0 (N = 154)	
WOMAC pain subscale	262.3 ± 106.6	259.7 ± 94.5	0.83
WOMAC function subscale	928.6 ± 341.5	891.9 ± 356.3	0.41
Arthritis Self-Efficacy Scale-8	5.6 ± 2.1	6.6 ± 2.1	0.0002
Beck Depression Inventory-II	9.6 ± 10.7	6.7 ± 7.7	0.01
PROMIS Distress-Anxiety Short Form	50.0 ± 9.1	50.2 ± 8.6	0.86
Perceived Stress Scale	14.2 ± 7.5	12.5 ± 6.6	0.06
MOS Social Support Survey	65.2 ± 22.3	67.6 ± 24.3	0.42

^aMean ± SD

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